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JEFFRIES WYMAN.

MEMORIAL MEETING

OF THE

BOSTON SOCIETY OF NATURAL HISTORY,

OCTOBER 7, 1874.



JEFFRIES WYMAN.

Died 4th September, 1874.

THE wisest man could ask no more of Fate
Than to be simple, modest, manly, true,
Safe from the Many, honored by the Few;
Nothing to count in World, or Church, or State,
But inwardly in secret to be great;
To feel mysterious Nature ever new,
To touch, if not to grasp, her endless clew,
And learn by each discovery how to wait;
To widen knowledge and escape the praise;
Wisely to teach, because more wise to learn;
To toil for Science, not to draw men's gaze,
But for her lore of self-denial stern;
That such a man could spring from our decays
Fans the soul's nobler faith until it burn.

J. R. L.

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REMARKS OF PRESIDENT BOUVÉ.

AFTER our usual summer vacation we meet together with more than accustomed emotion: for, mixed with the joy of greeting one another after separation, there is a consciousness of irreparable loss that weighs heavily upon our spirits, a recognition that there have gone away from us a force and a virtue which have so long been a help and an inspiration, that we cannot but feel a sense of loss such as no words of mine can adequately express. Sad indeed is it for us and for all, that such nobleness of nature, such wealth of acquired knowledge, such purity and simplicity of life, as were manifested in JEFFRIES WYMAN, should pass from the world; for rare, too rare, are to be found examples of such exalted character and attainments.

To our Society Prof. Wyman was a great benefactor; not in the sense of a donor especially, but in the higher sense of one imparting to it such honorable fame as enhanced greatly respect for it, both at home and abroad. To him also was the Society mainly indebted for the interest shown in our work by the late Dr. Walker, and which led directly to its large endowment with the means of success.

But pleasant as it would be for me, as a personal friend, to dwell upon the transcendent virtues of one whom I have always regarded with the highest respect and most affectionate esteem, I feel it would be unbecoming to further occupy your time in view of those present, who have come here with their tributes of love to the memory of our dear departed friend. I therefore close by inviting others to address you, first calling upon Prof. Gray, who, from his great regard for Prof. Wyman, has kindly prepared a notice of his life and work to read on this occasion.

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ADDRESS OF PROF. ASA GRAY.

WHEN we think of the associate and friend whose death this Society now deplores, and remember how modest and retiring he was, how averse to laudation and reticent of words, we feel it becoming to speak of him, now that he is gone, with much of the reserve which would be imposed upon us if he were living. Yet his own perfect truthfulness and nice sense of justice, and the benefit to be derived from the contemplation of such a character by way of example, may be our warrant for reasonable freedom in the expression of our judgments and our sentiments, taking care to avoid all exaggeration.

Appropriate and sincere eulogies and expressions of loss, both official and personal, have, however, already been pronounced or published; and among them one from the governors of that institution to which, together with our own Society, most of Professor Wyman's official life and services were devoted,—which appears to me to delineate in the fewest words the truest outlines of his character. In it the President and Fellows of Harvard University “recall with affectionate respect and admiration the sagacity, patience and rectitude which characterized all his scientific work, his clearness, accuracy and conciseness as a writer and teacher,

and the industry and zeal with which he labored upon the two admirable collections which remain as monuments of his rare knowledge, method and skill. They commend to the young men of the University this signal example of a character modest, tranquil, dignified and independent, and of a life simple, contented and honored."

What more can be or need be said? It is left for me, in compliance with your invitation, Mr. President, to say something of what he was to us, and has done for us, and to put upon record, for the use of those who come after us, some account of his uneventful life, some notice, however imperfect, of his work and his writings. I could not do this without the help of friends who knew him well in early life, and of some of you who are much more conversant than I am with most of his researches. Such aid, promptly rendered, has been thankfully accepted and freely used.

Our associate's father, Dr. Rufus Wyman, — born in Woburn, graduated at Harvard College in 1799, and in the latter part of his life Physician to the McLean Asylum for the Insane, — was a man of marked ability and ingenuity. Called to the charge of this earliest institution of the kind in New England at its beginning, he organized the plan of treatment and devised the excellent mechanical arrangements which have since been developed, and introduced into other establishments of the kind. His mother was Ann Morill, daughter of James Morill, a Boston merchant. This name is continued, and is familiar to us, in that of our associate's elder brother.

JEFFRIES WYMAN, the third son, derived his baptismal name from the distinguished Dr. John Jeffries, of Boston, under whom his father studied medicine. He was born on

the 11th of August, 1814, at Chelmsford, a township of a few hundred inhabitants in Middlesex Co., Mass., not far from the present city of Lowell. As his father took up his residence at the McLean Asylum in 1818, when Jeffries was only four years old, he received the rudiments of his education at Charlestown, in a private school; but afterwards went to the Academy at Chelmsford, and, in 1826, to Phillips Exeter Academy, where, under the instruction of Dr. Abbot, he was prepared for college. He entered Harvard College in 1829, the year in which Josiah Quincy took the presidency, and was graduated in 1833, in a class of fifty-six, six of whom became professors in the University. He was not remarkable for general scholarship, but was fond of chemistry, and his preference for anatomical studies was already developed. Some of his class-mates remember the interest which was excited among them by a skeleton which he made of a mammoth bull-frog from Fresh Pond, probably one which is still preserved in his museum of comparative anatomy. His skill and taste in drawing, which he turned to such excellent account in his investigations and in the lecture room, as well as his habit of close observation of natural objects met with in his strolls, were manifested even in boyhood.

An attack of pneumonia during his senior year in college caused much anxiety, and perhaps laid the foundation of the pulmonary affection which burdened and finally shortened his life. To recover from the effects of the attack, and to guard against its return, he made in the winter of 1833-34, the first of those pilgrimages to the coast of the Southern States, which in later years were so often repeated. Returning with strength renewed in the course of the following

spring, he began the study of medicine under Dr. John C. Dalton, who had succeeded to his father's practice at Chelmsford, but who soon removed to the adjacent and thriving town of Lowell. Here, and with his father at the McLean Asylum, and at the Medical College in Boston, he passed two years of profitable study. At the commencement of the third year he was elected house-student in the Medical Department, at the Massachusetts General Hospital, — then under the charge of Doctors James Jackson, John Ware and Walter Channing — a responsible position, not only most advantageous for the study of disease, but well adapted to sharpen a young man's power of observation.

In 1837, after receiving the degree of Doctor of Medicine, he cast about among the larger country towns for a field in which to practice his profession. Fortunately for science he found no opening to his mind; so he took an office in Boston, on Washington Street, and accepted the honorable, but far from lucrative post of Demonstrator of Anatomy under Dr. John C. Warren, the Hersey Professor. His means were very slender, and his life abstemious to the verge of privation; for he was unwilling to burden his father, who, indeed, had done all he could in providing for the education of two sons. It may be interesting to know that, to eke out his subsistence, he became at this time a member of the Boston Fire Department, under an appointment of Samuel A. Eliot, Mayor, dated Sept. 1, 1838. He was assigned to Engine No. 18. The rule was that the first-comer to the engine-house should bear the lantern, and be absolved from other work. Wyman lived near by, and his promptitude generally saved him from all severer labor than that of enlightening his company.

The turning point in his life, *i. e.*, an opportunity which he could seize of devoting it to science, came when Mr. John A. Lowell offered him the curatorship of the Lowell Institute, just brought into operation, and a course of lectures in it. He delivered his course of twelve lectures upon Comparative Anatomy and Physiology in the winter of 1840-41; and with the money earned by this first essay in instructing others, he went to Europe to seek further instruction for himself. He reached Paris in May, 1841, and gave his time at once to Human Anatomy at the School of Medicine, and Comparative Anatomy and Natural History at the Garden of Plants, attending the lectures of Flourens, Majendie, and Longet on Physiology, and of de Blainville, Isidore St. Hilaire, Valenciennes, Dumeril, and Milne-Edwards on Zoology and Comparative Anatomy. In the summer, when the lectures were over, he made a pedestrian journey along the banks of the Loire, and another along the Rhine, returning through Belgium, and by steamer to London. There, while engaged in the study of the Hunterian collections at the Royal College of Surgeons, he received information of the alarming illness of his father; he immediately turned his face homeward, but on reaching Halifax he learned that his father was no more.

He resumed his residence in Boston, and devoted himself mainly to scientific work, under circumstances of no small discouragement. But in 1843 the means of a modest professional livelihood came to him in the offer of the chair of Anatomy and Physiology in the medical department of Hampden-Sidney College, established at Richmond, Virginia. One advantage of this position was that it did not interrupt his residence in Boston except for the winter and

spring; and during these months the milder climate of Richmond was even then desirable. He discharged the duties of the chair most acceptably for five sessions, until, in 1847, he was appointed to succeed Dr. Warren as Hersey Professor of Anatomy in Harvard College, the Parkman professorship in the Medical School in Boston being filled by the present incumbent, Dr. Holmes. Thus commenced Prof. Wyman's most useful and honorable connection as a teacher with the University, of which the President and Fellows speak in the terms I have already recited. He began his work in Holden Chapel, the upper floor being the lecture-room, the lower containing the dissecting room and the anatomical museum of the College, with which he combined his own collections and preparations, which from that time forward increased rapidly in number and value under his industrious and skillful hands. At length Boylston Hall was built for the anatomical and the chemical departments, and the museum, lecture and working-rooms were established commodiously in their present quarters; and Prof. Wyman's department assumed the rank and the importance which it deserved. Both human and comparative anatomy were taught to special pupils, some of whom have proved themselves worthy of their honored master, while the annual courses of lectures and lessons on Anatomy, Physiology, and for a time the principles of Zoology, imparted highly valued instruction to undergraduates and others.

In the formation and perfecting of his museum—the first of the kind in the country, arranged upon a plan both physiological and morphological—no pains and labors were spared, and long and arduous journeys and voyages were made to contribute to its riches. In the summer of 1819,—

having replenished his frugal means with the proceeds of a second course of lectures before the Lowell Institute (*viz.*, upon Comparative Physiology, a good condensed short-hand report of which was published at the time),— he accompanied Capt. Atwood of Provincetown, in a small sloop, upon a fishing voyage high up the coast of Labrador; in the winter of 1852, going to Florida for his health, he began his fruitful series of explorations and collections in that interesting district. In 1854, accompanied by his wife, he travelled extensively in Europe, and visited all the museums within his reach. In the spring of 1856, with his pupils, Green and Bancroft, as companions and assistants, he sailed to Surinam, penetrated far into the interior in canoes, made important researches upon the ground, and enriched his museum with some of its most interesting collections. These came near being too dearly bought, as he and his companions took the fever of the country, from which he suffered severely, and recovered slowly. Again, in 1858–9, accepting the thoughtful and generous invitation of Capt. J. M. Forbes, he made a voyage to the La Plata, ascended the Uruguay and the Parana in a small iron steamer which Capt. Forbes brought upon the deck of his vessel; then, with his friend George Augustus Peabody as a companion, he crossed the pampas to Mendoza, and the Cordilleras to Santiago and Valparaiso, whence he came home by way of the Peruvian coast and the Isthmus.

By such expeditions many of the choice materials of his museum and of his researches were gathered, at his own expense, to be carefully prepared and elaborated by his own unaided hands. A vast neighboring museum is a splendid example of what munificence, called forth by personal enthu-

siasm, may accomplish. In Dr. Wyman's we have an example of what one man may do unaided, with feeble health and feebler means, by persistent and well-directed industry, without éclât, and almost without observation. While we duly honor those who of their abundance cast their gifts into the treasury of science, let us not — now that he can not be pained by our praise — forget to honor one who in silence and penury cast in more than they all.

Of penury in a literal sense we may not speak; for although Prof. Wyman's salary, derived from the Hersey endowment, was slender indeed, he adapted his wants to his means, foregoing neither his independence nor his scientific work; and I suppose no one ever heard him complain. In 1856 came unexpected and honorable aid from two old friends of his father who appreciated the son, and wished him to go on with his scientific work without distraction. One of them, the late Dr. William J. Walker, sent him ten thousand dollars outright; the other, the late Thomas Lee, who had helped in his early education, supplemented the endowment of the Hersey professorship with an equal sum, stipulating that the income thereof should be paid to Prof. Wyman during life, whether he held the chair or not. Seldom, if ever, has a moderate sum produced a greater benefit.

Throughout the later years of Prof. Wyman's life a new museum has claimed his interest and care, and is indebted to him for much of its value and promise. In 1866, when failing strength demanded a respite from oral teaching, and required him to pass most of the season for it in a milder climate, he was named by the late George Peabody one of the seven trustees of the Museum and Professorship of American

Archæology and Ethnology, which this philanthropist proceeded to found in Harvard University; and his associates called upon him to take charge of the establishment. For this he was peculiarly fitted by all his previous studies, and by his predilection for ethnological inquiries. These had already engaged his attention, and to this class of subjects he was thereafter mainly devoted, — with what sagacity, consummate skill, untiring diligence and success, his seven annual Reports — the last published just before he died, — his elaborate memoir on shell-heaps, now printing, and especially the Archæological Museum in Boylston Hall, abundantly testify. If this museum be a worthy memorial of the founder's liberality and foresight, it is no less a monument of Wyman's rare ability and devotion. Whenever the enduring building which is to receive it shall be erected, surely the name of its first curator and organizer should be inscribed, along with that of the founder, over its portal.

Of Prof. Wyman's domestic life, let it here suffice to record, that in Dec., 1850, he married Adeline Wheelwright, who died in June, 1855, leaving two daughters; that in August, 1861, he married Anna Williams Whitney, who died in February, 1864, shortly after the birth of an only and a surviving son.

Of his later days, of the slow, yet all too rapid progress of fatal pulmonary disease, it is needless to protract the story. Winter after winter, as he exchanged our bleak climate for that of Florida, we could only hope that he might return. Spring after spring he came back to us invigorated, thanks to the bland air and the open life in boat and tent, which acted like a charm; — thanks, too, to the watchful care of his attached friend, Mr. Peabody, his constant companion in

Florida life. One winter was passed in Europe, partly in reference to the Archæological Museum, partly in hope of better health; but no benefit was received. The past winter in Florida produced the usual amelioration, and the amount of work which Dr. Wyman undertook and accomplished last summer might have tasked a robust man. There were important accessions to the archæological collections, upon which much labor, very trying to ordinary patience, had to be expended. And in the last interview I had with him, he told me that he had gone through his own museum of comparative anatomy, which had somewhat suffered in consequence of the alterations in Boylston Hall, and had put the whole into perfect order. It was late in August when he left Cambridge for his usual visit to the White Mountain region, by which he avoided the autumnal catarrh; and there, at Bethlehem, New Hampshire, on the 4th of September, a severe hemorrhage from the lungs suddenly closed his valuable life.

Let us turn to his relations with this Society. He entered it in October, 1837, just thirty-seven years ago, and shortly after he had taken his degree of Doctor in Medicine. He was Recording Secretary from 1839 to 1841; Curator of Ichthyology and Herpetology from 1841 to 1847, of Herpetology from 1847 to 1855, of Comparative Anatomy from 1855 to 1874. While in these later years his duties may have been almost nominal, it should be remembered that in the earlier days a curator not only took charge of his portion of the Museum, but in a great degree created it. Then for fourteen years, from 1856 to 1870, he was the President of this Society, as assiduous in all its duties as he was wise in council; and he resigned the chair which he so long adorned

and dignified only when the increasing delicacy of his health, to which night-exposure was prejudicial, made it unsafe for him any longer to undertake its duties. The record shows that he has made here one hundred and five scientific communications,¹ several of them very important papers, every one of some positive value; for you all know that Prof. Wyman never spoke or wrote except to a direct purpose, and because there was something which it was worth while to communicate. He bore his part also in the American Academy of Arts and Sciences, of which he was a Fellow from the year 1843, and for many years a Councillor. To it he made a good number of communications; among them one of the longest and ablest of his memoirs.

Then he was from the first a member of the Faculty of the Museum of Comparative Zoology, where his services and his advice were highly valued. He was chosen President of the American Association for the Advancement of Science for the year 1857, but did not assume the duties of the office.

Some notice — brief and cursory though it must be — of such portion of Dr. Wyman's scientific work as is recorded in his published papers, should form a part of this account of his life.

His earliest publication, so far as we know, was an article in the Boston Medical and Surgical Journal, in 1837, signed only with the initials of his name. It is upon "The indistinctness of images formed from oblique rays of light," and the cause of it. The handling of the subject is as characteristic as that of any later paper. In January, 1841, we find his first recorded communication to this Society, "On the

¹ The Royal Society's Catalogue of Scientific Papers enumerates sixty-four by Prof. Wyman alone, and four in conjunction with others.

Cranium of a Seal." The first to the American Academy is the account of his dissection of the electrical organs of a new species of *Torpedo*, in 1843, part of a paper by his friend Dr. Storer, published in "Silliman's Journal." In the course of that year, eleven communications were made to our Society, besides the Annual Address, which he delivered on the 17th of May. The most important of these was the memoir, by Dr. Savage and himself, on the Black Orang or Chimpanzee of Africa, *Troglodytes niger*, published in full in the Journal of this Society, the anatomical part by Prof. Wyman. Two other papers of that early year, on the Anatomy of two Mollusca, *Tebennophorus carolinensis* and *Glandina truncata*, published in the fourth volume of the Society's Journal, each with a copper plate, are noteworthy, as showing that he possessed from the first that happy faculty of clear, terse, and closely relevant exposition, and that skill and neatness of illustration with his pencil, which characterize all his work, both of research and instruction.

Another paper of that year, "On the microscopic structure of the teeth of the *Lepidosteus*, and their analogies with those of the *Labyrinthodonts*," read to this Society in August, and published in Silliman's Journal in October, 1843, was important and timely. In it he demonstrated that the labyrinthine structure of the teeth, considered at the time to be peculiar to certain sauroid reptiles, equally belonged to the gar-fishes, and consequently that many fossil teeth which had been referred by the evidence of this character alone to a group of reptiles founded upon this peculiarity, might as well belong to ancient sauroid fishes.

Although not of any importance now to remember, I may here mention his report to this Society on the *Hydrarchos*

Sillimani of Koch, a factitious Saurian of huge length, successfully exhibited in New York and elsewhere under high auspices, and I think also in Germany, but which Dr. Wyman exposed at sight, showing that it was made up of an indefinite number of various cetaceous vertebræ, belonging to many individuals, which (as was afterward ascertained) were collected from several localities.

But the memoir by which Prof. Wyman assured his position among the higher comparative anatomists was that, communicated to and published by this Society in the summer of 1847, in which the Gorilla was first named and introduced to the scientific world, and the distinctive structure and affinities of the animal so thoroughly made out from the study of the skeleton, that there was, as the great English Anatomist remarked, "very little left to add, and nothing to correct." In this memoir the "Description of the habits of *Troglodytes Gorilla*," is by Dr. Thomas S. Savage, to whom, along with Dr. Wilson, "belongs the credit of the discovery"; the Osteology of the same and the introductory history are by Dr. Wyman. Indeed, nearly all since made known of the Gorilla's structure, and of the affinities soundly deduced therefrom, has come from our associate's subsequent papers, founded on additional crania brought to him in 1849, by Dr. George A. Perkins of Salem; on a nearly entire male skeleton of unusual size, received in 1852, from the Rev. William Walker, and now in Wyman's museum; and on a large collection of skins and skeletons placed at his disposal in 1859, by Du Chaillu, along with a young Gorilla in spirits, which he dissected. It is in the account of this dissection that Prof. Wyman brings out the curious fact that the skull

of the young Gorilla and Chimpanzee bears closer resemblance to the adult than to the infantile human cranium.

In Prof. Wyman's library, bound up with a quarto copy of the Memoir by Dr. Savage and himself, is a terse but complete history of this subject, in his neat and clear handwriting, and with copies of the letters of Dr. Savage, Prof. Owen, Mr. Walker, and M. du Chaillu.

In the introductory part of the Memoir, Prof. Wyman states that "the specific name, *Gorilla*, has been adopted, a term used by Hanno in describing the wild men found on the coast of Africa, probably one of the species of the Orang." The name, *Troglodytes Gorilla*, is no doubt to be cited as of Savage and Wyman, and it was happily chosen by Prof. Wyman, after consultation with his friend, the late Dr. A. A. Gould, for the reason just stated. But it is interesting to see, in the correspondence before me, how strenuously each of the joint authors deferred to the other the honor of nomenclature. Dr. Savage from first to last insists, in repeated and emphatic terms, that the scientific name shall be given by Dr. Wyman as the scientific describer, and that he could not himself honestly appropriate it. Prof. Wyman, in his mss. account, after mentioning what his portion of the Memoir was, and that "the determination of the differential characters on which the establishment of the species rests was prepared by me," briefly and characteristically adds: "In view of this last fact, Dr. Savage thought, as will be seen in letter, that the species should stand in my name; but this I declined."

This Memoir was read before this Society on the 18th of August, 1847, and was published before the close of the year. But it had not, as it appears, come to Prof. Owen's knowl-

edge when the latter presented to the London Zoological Society, on the 22d of February, 1848, a memoir founded on three skulls of the same species, just received from Africa through Capt. Wagstaff. When Prof. Owen received the earlier Memoir, he wrote to compliment Prof. Wyman upon it, substituted in a supplementary note the specific name imposed by Savage and Wyman, and reprinted in an appendix the osteological characters set forth by the latter. "It does not appear, however (adds Dr. Wyman), either in the Proceedings or the Transactions of the [Zoological] Society, at what time our Memoir was published, nor that we had anticipated him in our description."

It is safe to assert that in this and the subsidiary papers of Dr. Wyman, may be found the substance of all that has since been brought forward, bearing upon the osteological resemblances and differences between men and apes. After summing up the evidence, he concludes:—

"The organization of the anthropoid *Quadruman*a justifies the naturalist in placing them at the head of the brute creation, and placing them in a position in which they, of all the animal series, shall be nearest to man. Any anatomist, however, who will take the trouble to compare the skeletons of the Negro and Orang, cannot fail to be struck at sight with the wide gap which separates them. The difference between the cranium, the pelvis, and the conformation of the upper extremities in the Negro and Caucasian, sinks into comparative insignificance when compared with the vast difference which exists between the conformation of the same parts in the Negro and the Orang. Yet it cannot be denied, however wide the separation, that the Negro and Orang do afford the points where man and the brute, when the totality

of their organization is considered, most nearly approach each other."

Selecting now for further comment only some of the more noticeable contributions to science, we should not pass by his investigations of the anatomy of the Blind Fish of the Mammoth Cave. The series began, in that prolific year, 1843, with a paper published in "Silliman's Journal," and closed with an article in the same Journal in 1854. Although Dr. Tellkamp had preceded him in ascertaining the existence of rudimentary eyes and the special development of the fifth pair of nerves, yet for the whole details of the subject, and the minute anatomy, we are indebted to Prof. Wyman. Many of the details, however, as well as the admirable drawings illustrating them, remained unpublished until 1872, when he placed them at Mr. Putnam's disposal, and they were brought out in his elaborate article in the "American Naturalist." Here the extraordinary development of tactile sense, taking the place of vision, and perfectly adapting the animal to its subterranean life, is completely demonstrated.

If Prof. Wyman's first piece of anatomical work was the preparation of a skeleton of a bull-frog, in his undergraduate days, his most elaborate memoir is that on the anatomy of the nervous system of the same animal (*Rana pipiens*), published in the "Smithsonian Contributions," in 1852 (51 pages, royal 4to, with 2 plates).

Anything like an analysis of this capital investigation and exposition would much overpass our limits. For, although the special task he assigns to himself is the description of the nervous system of a single Batrachian, chiefly of its peripheral portion, and of the changes undergone during metamorphosis, he is led on to the consideration of several

abstruse or controverted questions;—such, for instance, as the attempts that have been made to homologize the nervous system of Articulates with that of Vertebrates, upon which he has some acute criticism;—the theories that have been propounded respecting the functions of the cerebellum and its relation to locomotion, which he tests in a characteristic way by a direct appeal to facts;—the supposition of Cuvier that the special enlargements of the spinal cord are in proportion to the force of the respective limbs supplied therefrom; which he controverts decisively by similar appeal, an extract from which I beg leave to append in a note.¹

So, in describing the structure of the optic nerves in the frog, and the development of the eye and optic lobes, he proceeds to remark, that—

“The instances of *Proteus* and *Amblyopsis* naturally suggest the questions, whether one and the same part may not combine functions wholly different in different animals, and

¹“If by force is meant the muscular energy and development of the limbs, this statement does not appear to be sustained in the present instance, nor in many other instances brought to notice by comparative anatomy. In man the brachial enlargement is always larger than the crural, though the legs are so much more powerfully developed than the arms, and the same is true of the greater number of mammals. In frogs there is a still greater disproportion between legs and arms yet there is not a corresponding difference in the size of the bulgings. They cannot, therefore, be said to be in proportion to the muscular force only of the limbs, but correspond far more nearly to the acuteness of the sense of touch, which in man and mammals is more delicate in the hands and arms than in the legs and feet. In bats, it is true that the muscular force of the arms is greater than that of the legs, and that the brachial far surpasses the crural enlargement; but, at the same time, the sense of touch in the membranes of the wings is exalted to a most extraordinary degree. In birds the posterior bulging is almost universally the largest, though this condition is in part dependent upon the presence of the rhomboidal sinus. In these animals, while the muscular energy of the wings is the most developed, the sensibility of the feet is the more acute.”

whether the same may not hold true with regard to the cerebral organs which is known to obtain with regard to the skeleton, the teeth, the tongue, and the nose, that identical or homologous parts in different animals may perform functions wholly distinct. If the doctrine here suggested can be admitted (and if this were the place facts could be cited in support of it), may we not find in it an explanation of many inconsistencies which now exist between the results of comparative anatomy and of physiology?"

Then, in his chapter on the philosophical anatomy of the cranial nerves and skull, after showing that there are but three pairs of cranio-spinal nerves, he takes up the controverted question as to the number of vertebræ which compose the skull, and supports the opinion that they also are only three in a characteristic manner.¹

Of this whole memoir it is thought that, notwithstanding the great advance which has been made in comparative anatomy during the twenty-five years which have elapsed since it was published, its importance to the student has not at all diminished.

¹"The conclusions which have been drawn from the statements made above are as follows: that in frogs the *vagus* comprises the glosso-pharyngeal and accessory nerves; that the *trigeminus* comprises the facial, the abducens, and in the salamanders the patheticus and portions of the motor communis; that other evidence sustains the hypothesis, that the whole of the motor communis is a dependence of the trigeminus; if to these we add the *hypoglossus* (which in frogs is exceptionally a spinal nerve), we shall have three pairs of cranial nerves, each having all the characters of a common spinal nerve, namely, motor and sensitive roots and a ganglion; that there are no nerves to indicate a fourth vertebra, unless the special sense nerves are considered; if these are admitted as indications, then we must presuppose either two pairs of nerves to each vertebra, or the existence of six vertebræ, which is a larger number than can be accounted for on an osteological basis. The functions and mode of development of the special sense nerves we have taken as affording sufficient grounds for considering them as of a peculiar order, and not to be classified with common spinal nerves."

Next to this in extent and value may be ranked Prof. Wyman's paper on the development of the common skate of our waters (*Raia Batis*), communicated to the American Academy in 1864, and published among its Memoirs. It gives an account of the peculiar egg-case of the Selachians, and of the several stages of the development of the embryo skate, expressed in the concise and clear language — as little technical as possible, — for which he was distinguished, and leading up to not a few problems in comparative anatomy, morphology, or systematic zoology, — problems which Prof. Wyman never evaded when they came directly in his way, and seldom handled without making some real contribution to their elucidation. For instance, in describing the external branchial fringes of the young skate, he notes the agreement in this character with the Batrachians; and in studying the seven branchial fissures of the embryo, he is brought into contact with the view of Huxley, that the formation of the external ear is by involution of the integument. After confirming the contrary observations of Reichert, on the embryo pig, he concludes that “the first of the seven branchial fissures of the embryo skate is converted into the spiracle, which is the homologue of the Eustachian tube and the outer ear-canal.” After a full discussion of the homology of the upper jaw in sharks and skates, under the light afforded by his investigation of the embryo skate, he suggests that the cartilage which extends from the olfactory fossæ towards the pectoral fin is the probable homologue of a maxillary bone, and that in the lobe, the homologue of an intermaxillary; that, if so, the skates and proteiform reptiles agree in having the nostrils open in front of the dental arch; that while in all Batrachians the nasal groove becomes closed, in the skate

it remains permanently open; and finally that this view, if confirmed, "will add another feature which justifies Owen, Agassiz and others, in dissenting from Cuvier so far as to give the Selachians a place in the zoological series higher than that of the bony fishes. But at the same time, it will give corroborative proof of the correctness of Cuvier's view, that 'the rudiments of the maxillaries, and intermaxillaries, . . . are evident in the skeleton.'"

In attempting these analyses, I am drifting into a fault which Prof. Wyman never committed, that of being too long. So I must leave many of his papers unmentioned, and barely refer to two or three others which cannot be passed over. The most noteworthy of the shorter papers, however, are upon less technical or more generally interesting topics, so that we have need only to be reminded of them. Among them are his "Observations on the Development of the Surinam Toad," and the same of "*Anableps Gronovii*," and the paper "On some unusual Modes of Gestation." The importance of these papers lies, not in being accounts of some of the most striking curiosities of the animal world, but in the sagacity and quickness with which he discerned, and the clearness with which he taught, the lessons to be learned from them. Any good zoologist, with the same excellent opportunities, would have worked out all the details of the development of the Surinam toads in the skin of the back of their mother, and would equally have noted the morphological significance of the branchiæ and tail, that are never to know any thing of the element they are adapted for; but Dr. Wyman remarks upon the development of the limbs independently of the vertebral axis, as showing that, whatever view be taken of their homology, they are some-

thing superadded to it, and not evolved from it; he notes how the *whole* yolk-mass is moulded into a spiral intestine; and that the embryo at the end of incubation forms a larger and heavier mass than existed in the egg when it commenced, — showing that there was an absorption of material furnished by the dermal sac of the mother, — “a solitary instance among Batrachians, if not among Reptiles generally, in which the embryo is nourished at the expense of materials derived from the parent.” From this he is led (in the later paper above mentioned), to infer the probability that the developed larvæ of *Hylodes lineatus*, — carried about inland upon the back of their mother, and destitute of limbs adapted to terrestrial locomotion, — may depend upon a secretion from the body for needful sustenance — an interesting and rudimentary foreshadowing of mammalian life, of which he discerned the bearings.

His “Description of a Double Fœtus” (in the “Boston Medical and Surgical Journal, March, 1866), gives him the opportunity of briefly recording some of the results of his studies of the development of double monsters, and to bring out his view, that “the force, whatever it be, which regulates the symmetrical distribution of matter in a normal or abnormal embryo, has its analogy, if anywhere, in those known as polar forces”; that “studying the subject in the most general manner, there are striking resemblances between the distribution of matter capable of assuming a polar condition, and free to move around a magnet, and the distribution of matter around the nervous axis of an embryo.” That this is not one of those vague conceptions by which many speculators set about to explain that of which they know little by means of that of which they know less, but that he had striking

parallelisms to adduce, the close of this striking paper shows.

The subject of fore and hind symmetry, thus brought directly under notice, had been broached by Dr. Wyman several years before. He returned to it the year following, in his very important morphological paper, "On Symmetry and Homology in Limbs," read to this Society in June, 1867, and published in the Proceedings of that date. It is interesting to observe with what caution and restraint he handled this doctrine of "reversed repetitions," which has since been freely developed by one of his pupils who has a special predilection for speculative morphology, Prof. Burt Wilder.

Prof. Wyman's "Notes on the Cells of the Bee," in the "Proceedings of the American Academy" for January, 1866, is a characteristic specimen of his way of coming directly down to the facts, and making them tell their own story. I could not recapitulate his results much more briefly than he records them in his paper. I need not recall to you how neatly he made this investigation, and represented some of the results, filling the comb with plaster-of-paris and then cutting it across midway, so that the observations might be made and the cells measured just where they are most nearly perfect; and then printing impressions of the comb upon the wood-block, he reproduces on the pages of his article the exact outlines of the cells, with all their irregularities and imperfections. But I cannot refrain from citing a portion of his remarks at the close:—

"Here, as is so often the case elsewhere in nature, the type-form is an ideal one; and with this real forms seldom or never coincide. . . . An assertion, like that of Lord Brougham, that there is in the cell of the bee 'perfect agreement' between theory and observation, in view of the anal-

ogies of nature is more likely to be wrong than right; and his assertion in the case before us is certainly wrong. Much error would have been avoided if those who have discussed the structure of the bee's cell had adopted the plan followed by Mr. Darwin, and studied the habits of the cell-making insects comparatively, beginning with the cells of the humble-bee, following with those of wasps and hornets, then with those of the Mexican bees (*Melipona*), and finally with those of the common hive-bee. In this way, while they would have found that there is a constant approach to the perfect form, they would at the same time have been prepared for the fact, that even in the cell of the hive-bee perfection is not reached. The isolated study of anything in natural history is a fruitful source of error."

Let me add to this important aphorism its fellow, which I have from him, but know not if he ever printed it. "*No single experiment in physiology is worth anything.*"

The spirit of these aphorisms directed all his work. It is well exemplified in his experimental researches—the last which I can here refer to, upon—"The formation of Infusoria in boiled solutions of organic matter, enclosed in hermetically sealed vessels and supplied with pure air," and its supplement, "Observations and Experiments on living organisms in heated water," published in the American Journal of Science and Arts, the first in the year 1862, the other in 1867. Milne-Edwards could not have known the man, when he questioned the accuracy of the first series because they do not agree with those of Pasteur, and thought the difference in the results depended upon a defective mode of conducting the experiments. As Dr. Wyman remarks in a note to the second series, "the recent experiments of Dr. Child of

Oxford, and those reported in this communication, are sufficient answer to the criticisms of M. Edwards." Then as to his thoroughness:—most persons would have rested on the results of his thirty-three well-devised experiments, proving "that the boiled solutions of organic matter made use of exposed only to air which has passed through tubes heated to redness, became the seat of infusorial life;" but all would not have concluded that, after all, they "throw but little light on the immediate source from which the organisms have been derived," nor would many have closed an impartial summary of the opposing views in this judicial way:—

"If, on the one hand, it is urged that all organisms, in so far as the early history of them is known, are derived from ova, and therefore from analogy we must ascribe a similar origin to these minute beings the early history of which we do not know, it may be urged with equal force, on the other hand, that all ova and spores, in so far as we know anything about them, are destroyed by prolonged boiling; therefore from analogy we are equally bound to infer that Vibrios, Bacterians, etc., could not have been derived from ova, since these would all have been destroyed by the conditions to which they have been subjected. The argument from analogy is as strong in the one case as in the other."

Returning to the subject again a few years later, with a critical series of twenty experiments, each of three, five, ten, fifteen, or even twenty flasks, used by way of checks and comparisons,—a rigorous experimenter would have been satisfied when he had proved that sealed solutions subjected to a heat of at least 212° for from *one* to *four* hours, became the seat of infusorial life, at least of such as Vibrios, Bacterians and Monads, while all infusoria having the faculty of locomotion

were shown by a special series of experiments to lose this at a temperature of 120°, or at most 134° Fahr. But Prof. Wyman carried the boiling up to *five* hours, and in these flasks no infusoria of any kind appeared. The question of abiogenesis stands to-day very much where Prof. Wyman left it seven years ago.

I must omit all notice of the ethnological work which has occupied his later years, merely referring to the seven Annual Reports of the Trustees of the Peabody Museum of American Archæology and Ethnology, of which he was curator. The last of these, issued just before the writer's death, contains the principal results of his investigation of the human remains he collected in the shell-heaps of East Florida, and convincing evidence of the cannibalism of those who made them. A fuller memoir, embodying all his observations of the last six winters upon the Florida shell-mounds, was sent to the printer just before he died.

The thought that fills our minds upon a survey even so incomplete as this is: How much he did, how well he did it all, and how simply and quietly! We knew that our associate, though never hurried, was never idle, and that his great repose of manner covered a sustained energy; but I suspect that none of us, without searching out and collecting his published papers, had adequately estimated their number and their value. There is nothing forth-putting about them, nothing adventitious, never even a phrase to herald a matter which he deemed important.

His work as a teacher was of the same quality. He was one of the best lecturers I ever heard, although, and partly because, he was the most unpretending. You never thought of the speaker, nor of the gifts and acquisitions which such

clear exposition were calling forth, — only of what he was simply telling and showing you. Then to those who, like his pupils and friends, were in personal contact with him, there was the added charm of a most serene and sweet temper. He was truthful and conscientious to the very core. His perfect freedom, in lectures as well as in writing, and no less so in daily conversation, from all exaggeration, false perspective, and factitious adornment, was the natural expression of his innate modesty and refined taste, and also of his reverence for the exact truth.

It has been a pleasure to learn, from former college students, who hardly ever saw him except in the lecture-room, that he gave to them much the same impression of his gifts and graces, and sterling worth, that he gave us who knew him intimately — so transparent was he, and natural.

With all his quick sense of justice, and no lack of occasion for controversy, it seemed to cost him no effort to avoid it altogether. He made no enemies, and was surrounded by troops of life-long friends. When he first went abroad, in 1841, he was told by some near friends, who recognized his promise, that a chair of Natural History in his alma mater would soon have to be filled, and that he should be presented as a candidate. In the winter following, the present incumbent, responding to an invitation to visit Boston, which he had never seen, and to consider if he would be a candidate, then first heard of Wyman's name and of his friends' expectations or hopes; whereupon he dismissed the subject from his mind. Probably he felt more surprise than did Dr. Wyman when notified, a few months afterwards, of the choice of the Corporation. The exigencies of the Botanic Garden probably overbore other considerations. I doubt if Dr. Wy-

man ever had an envious feeling. Certain it is that no one welcomed the new professor with truer cordiality, or proved himself a more constant friend.

In these days it is sure to be asked how an anatomist, physiologist, and morphologist like Prof. Wyman regarded the most remarkable scientific movement of his time, the revival and apparent prevalence of doctrines of evolution. As might be expected, he was neither an advocate nor an opponent. He was not one of those persons who quickly make up their minds, and announce their opinions, with a confidence inversely proportionate to their knowledge. He could consider long, and hold his judgment in suspense. How well he could do this appears from an early, and so far as I know, his only published presentation of the topic, in a short review of Owen's "Monograph of the Aye-Aye" (in *Am. Journ. Science*, Sept., 1863) — the paper in which Prof. Owen's acceptance of evolution, but not of natural selection, was promulgated. Dr. Wyman compares Owen's view with that of Darwin (to whom he had already communicated interesting and novel illustrations of the play of natural selection); and he adds some acute remarks upon a rather earlier speculation by Mr. Agassiz, in which the latter suggests that the species of animals might have been created as eggs rather than as adults. He states the case between the two general views with perfect impartiality, and the bent of his own mind is barely discernible. In due time he satisfied himself as to which of them was the more probable, or, in any case, the more fertile hypothesis. As to this, I may venture to take the liberty to repeat the substance of a conversation which I had with him sometime after the death of the

lamented Agassiz, and not long before his own. I report the substance only, not the words.

Agassiz repeated to me, he said, a remark made to him by Humboldt, to the effect that Cuvier made a great mistake, and missed a great opportunity, when he took the side he did in the famous controversy with Geoffroy St. Hilaire; he should have accepted the doctrines of morphology, and brought his vast knowledge of comparative anatomy and zoology, and his unequalled powers, to their illustration. Had he done so, instead of gaining by his superior knowledge some temporary and doubtful victories in a lost cause, his preëminence for all our time would have been assured and complete. I thought, continued Wyman, that there was a parallel case before me,—that if Agassiz had brought his vast stores of knowledge in zoology, embryology, and palæontology, his genius for morphology, and all his quickness of apprehension and fertility in illustration, to the elucidation and support of the doctrine of the progressive development of species, science in our day would have gained much, some grave misunderstandings been earlier rectified, and the permanent fame of Agassiz been placed on a broader and higher basis even than it is now.

Upon one point Wyman was clear from the beginning. He did not wait until evolutionary doctrines were about to prevail, before he judged them to be essentially philosophical and healthful, “in accordance with the order of Nature, as commonly manifested in her works,” and that they need not disturb the foundations of natural theology.

Perhaps none of us can be trusted to judge of such a question impartially, upon the bare merits of the case; but Wyman’s judgment was as free from bias as that of any one

I ever knew. Not at all, however, in this case from indifference or unconcern. He was not only, philosophically, a convinced theist, in all hours and under all "variations of mood and tense," but personally a devout man, an habitual and reverent attendant upon Christian worship and ministrations.

Those of us who attended his funeral must have felt the appropriateness for the occasion of the words which were there read from the Psalmist :—

"The Heavens declare the glory of God, and the firmament sheweth his handy-work. . . . O Lord, how manifold are thy works! In wisdom hast thou made them all; the earth is full of thy riches; so is this great and wide sea, wherein are things creeping innumerable, both great and small beasts. Thou sendest forth thy spirit, they are created, and thou renewest the face of the earth."

These are the works which our associate loved to investigate, and this the spirit in which he contemplated them. Not less apposite were the Beatitudes that followed :—

Blessed are the meek; blessed are the peace-makers; blessed are the merciful; blessed are the pure in heart.

Those who knew him best, best know how well he exemplified them.

RESOLUTIONS.

Mr. F. W. Putnam offered the following Resolutions : —

Resolved : — That in the death of JEFFRIES WYMAN the Boston Society of Natural History mourns the loss of a most honored member and efficient officer; one who was untiring in his labors for the Society during his long and active connection with it as Curator, Secretary and President; and that, in his death, Science has lost a most thorough and careful investigator, and the cause of education and truth a most devoted and conscientious disciple.

Resolved : — That as members of a Society who gave to Professor Wyman the highest honor and position we could bestow, we acknowledge our indebtedness to him for the thoughtfulness and care with which he guided our labors for so many years, and, while filled with sorrow at our own loss, we ask the privilege, by transmission of these resolutions, of extending our sympathy to his bereaved family in their great trial.

These Resolutions were seconded by Dr. D. H. Storer, who said : —

Mr. President, I most cordially second the adoption of the Resolutions which have been presented. The scientific reputation of our departed friend was universally acknowledged, but the beauty of his life was equally worthy of admiration. I never knew a gentler, purer, nobler spirit. As a brother I loved him, and I mourn him.

The Resolutions were unanimously adopted.

LETTER FROM PROF. ROGERS.

NEWPORT, Oct. 6, 1874.

TO PRES. BOUVÉ,

My dear friend:—I regret that it will not be in my power to attend the meeting of the Natural History Society tomorrow evening, as I should greatly desire to unite with you in an affectionate tribute to the memory of Prof. Wyman, whose long services as President of the Society, and whose peculiar excellences as a student of nature must ever claim our regard and admiration.

From my first acquaintance with him, while engaged in the delicate microscopic dissections with which he illustrated the work of the late Dr. Amos Binney on Land-shells, until within a few years past, I have had frequent opportunities of marking his scientific progress; and although but little acquainted with the inquiries to which he chiefly devoted himself, I have understood enough of his labors to appreciate his singular patience and accuracy as an observer, his ingenuity in devising experiments, and the caution and conscientiousness with which he was accustomed to report the results of his investigations.

These qualities, early recognized by his scientific co-workers abroad as well as at home, placed him in the front rank of the promoters of the biological sciences. To these intellectual gifts was added a modesty and self-forgetfulness which, while they were unfavorable to the more popular recognition of his merits, have rendered his example preëminently worthy of imitation by all honest seekers after truth.

Yours faithfully,

WILLIAM B. ROGERS.

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